

REMARKS

Claims 1-23 are all the claims pending in the application prior to entry of the above amendment. Claims 15 and 20-23 have been withdrawn from consideration.

Review and reconsideration on the merits is respectfully requested.

Claim 2 has been amended as follows: A packing material for solid phase extraction, comprising a synthetic polymer obtained by copolymerizing a hydrophobic monomer (A) which comprises an aromatic divinyl compound and a hydrophilic monomer (B) which comprises a (meth)acrylic acid ester of a polyhydric alcohol having a hydroxyl group and introducing thereto an ion exchange group by a chemical modification comprising the step of introducing said ion exchange group by chemically bonding it to a hydroxyl group introduced from said (meth)acrylic acid ester of polyhydric alcohol having a hydroxyl group as the hydrophilic monomer (B), wherein said ion exchange group is covalently bonded to said polymer. Support for the amendment can be found, e.g., in the original Claims 1, 3, 6 and 8 and in the specification at page 9, line 24 to page 10, line 8, as originally filed. No new matter has been added. Entry of the Amendment is hereby requested.

Formal Matters

On the Office Action Summary sheet, the Examiner has acknowledged Applicants' claim for foreign priority and receipt of a certified copy of the priority document. However, the Examiner did not acknowledge Applicants' claim for domestic priority under 35 U.S.C. §119(e) to the U.S. Provisional Application No. 60/279,108, filed on March 28, 2001, and receipt of the sworn translation of the provisional in the present application.

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We kindly request that the Examiner formally acknowledge Applicants' claim for domestic priority and receipt of the sworn translation of the provisional.

The Examiner has also returned an initialed and signed copy of the Form PTO 1449 submitted to the Patent Office on April 3, 2002. However, the Examiner appears to have overlooked the reference to the M.S. Mills et al. article as he failed to place his initials next to that reference.

We kindly request that the Examiner formally acknowledge considering this reference by returning to us a copy of the form PTO 1449 including an indication that he has considered the M.S. Mills et al. article.

Restriction Requirement/Election of Species Requirement

Applicants affirm the election to prosecute the invention of Group I, claims 1-14 and 16-19, and the species as exemplified in Example I, wherein the ion exchange group is introduced by reaction with triethylamine, i.e., a copolymer of N-vinyl-2-pyrrolidone (NVP), divinylbenzene (DVB) and glycerol dimethacrylate, to which epoxy groups are introduced by reaction with epichlorohydrin, which is then reacted with triethylamine to form a copolymer with quaternary ammonium ions exchange groups. Election is made without traverse.

Claim Rejections - 35 USC § 112, First Paragraph

Claims 1-7, 9-14 and 16-19 have been rejected under 35 U.S.C. § 112, first paragraph, allegedly because the specification, while being enabling for,

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(a.) packing materials wherein the ion exchange group is covalently bonded to the polymer, does not reasonably provide enablement for packing materials wherein the ion exchange group is not covalently bonded to the polymer (claims 1-7, 9-14 and 16-19), and

(b.) packing materials made from a copolymer comprising a (meth)acrylic ester of a polyhydric alcohol and having a hydroxyl group, does not reasonable provide enablement for packing materials which still contain either a (meth)acrylic ester of a polyhydric alcohol and having a hydroxyl group (monomer), or a polymer with such a monomeric unit (claims 6-7).

The rejection under 35 U.S.C. § 112, first paragraph, is respectfully traversed. Claims 1 and 8 have been canceled, and Claim 2 has been amended to more clearly define Applicants' invention and to overcome the rejection.

As Claim 1 has been canceled and Claim 8 has been incorporated into Claim 2, this should obviate the Examiner's rejection of Claims 1-7, 9-14 and 16-19. Claim 2 now clearly recites that the ion exchange group is covalently bonded to the polymer.

Also by this amendment, Applicants believe that the rejection of Claims 6-7 has been overcome, and that it becomes apparent to use "a (meth)acrylic acid ester of polyhydric alcohol having a hydroxyl group" at the copolymerization and thereafter introduce a necessary amount of ion exchange group by making use of that hydroxyl group.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 112, first paragraph.

Claim Rejections - 35 USC § 112, Second Paragraph

Claims 4, 6 and 14 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

The rejection is respectfully traversed.

The rejection of Claims 4 and 6 has been obviated by Applicants' amendments to Claims 4 and 6 and cancellation of Claim 1. The language of Claim 4 is no longer indefinite because there is antecedent basis in Claim 2. ✓

The language of Claim 6 is no longer indefinite because "the hydrophilic monomer (B)" contains antecedent basis in Claim 2. ✓

As for Claim 14, Applicants submit that the average particle size is a weight average particle size. ✓

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 112, second paragraph.

Claim Rejections - 35 USC § 102(b)/§ 103(a)

Claims 1-5, 8-14 and 16-19 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Lee.


The Examiner asserts that Lee discloses ion exchange polymers containing both a hydrophobic group (e.g., DVB) and an ion exchange group (e.g., a sulfonate group or a quaternary ammonium group), as for example are exemplified in Examples 2 and 6; said

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examples exemplify introducing the ion exchange group into a DVB/NVP copolymer; DVB/NVP copolymers containing 13, 14, 16, 20 and 22 mole% NVP, the remainder being made up of monomers from DVB of 80 % purity are exemplified in Example 1, which clearly teaches an aromatic divinyl compound in an amount of 30% by mass or more, as well as a NVP within the range of 5 to 60% by mass; amounts of ion exchange groups well in excess of 5 μ -equiv/gram are exemplified for both the sulfonate and quaternary ammonium groups (e.g., Tables 1 and 6); the resins preferably have a particle size of about 20 to about 200 μ m (col. 6, lines 61-66); the use of columns and cartridges containing particles of the ion exchange resin are also disclosed (e.g., col. 10, line 46 to col. 11, line 16); as to any further limitations of Claims 11-13 and 16-19, these are seen by the Examiner as intended uses which do not impart patentability to the claimed subject matter.

The rejection of Claims 1-5, 8-14 and 16-19 under 35 U.S.C. §102(b) as allegedly anticipated by Lee et al. is respectfully traversed for at least the reason that Claim 2 has been newly amended to incorporate part of the recitation of Claim 6. Amended Claim 2 is not anticipated by Lee et al.

In Lee et al., a sulfone group is introduced directly to a benzene ring (Example 2) or a tertiary amino group or a quaternary ammonium group is introduced through chloromethylation of a benzene ring (Examples 5 and 6), and this differs from a technique of, as recited in amended Claim 2 above, introducing an ion exchange group into the OH group in the alcohol moiety of a (meth)acrylic acid ester.



Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 102(b).

Claims 1-6, 8-14, 16 and 18 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Miyake.

The Examiner asserts that Miyake discloses strongly basic ion exchange resins from about 6 to about 98 wt % of a quaternized dialkylaminoethylstyrene units and 2 to 94 wt.% cross-linking monomers (col. 1, lines 38-68); quaternization is achieved by reaction with quaternizing agents such as for example methyl iodide or ethyl chloride (col. 13, lines 23-44, and Example 6); examples of the polymers which can be quaternized are p-diethylaminoethylstyrene-DVB copolymers containing 18 or 36 wt.% DVB monomeric units (Examples 1 and 2); the amounts of ion exchange groups are well in excess of 5 μ -equiv per gram; particle diameters of 50 to 200 μ m are exemplified in Example 1; packing of the copolymers into a column is also taught (col. 3, lines 8-13, an Example 3); the inclusion of other monoethenically unsaturated monomers is also taught in amounts preferably at most 60 wt.% or more preferably at most 40 wt.%; thus, the Examiner concludes that one of ordinary skill in the art would have readily envisaged including 40 or 60 wt% of the listed monomers in the ion exchange resins, among which both hydroxyethyl methacrylate (a methacrylate ester of a polyhydric alcohol having a hydroxy group) and NVP are specifically disclosed as examples; as to any further limitations of Claims 11-13, 16 or 18, these are seen by the Examiner as intended uses which do not impart patentability to the claimed subject matter.

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The rejection of Claims 1-6, 8, 14, 16 and 18 under 35 U.S.C. §102(b) is respectfully traversed for at least the reason that Claim 2 has been newly amended. Amended Claim 2 is not anticipated by Miyake et al. ✓

Applicants submit that Miyake et al. describes a production method of ion exchange resin but differs from the present invention in that an aromatic divinyl compound as the hydrophobic monomer (A) is not contained. Also, in Miyake et al., a monomer having an ion exchange group is previously synthesized (Syntheses 1 to 6) and thereafter used for the copolymerization, and this substantially differs from the method of the present invention where an ion exchange group is introduced by making use of the OH group of a polymer.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 102(b).

Claims 17 and 19 have been rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Miyake as applied to Claims 1-6, 8-14, 16 and 18 above, and further in view of Lee. ✓

The Examiner admits that Miyake is deficient in not disclosing cartridges as opposed to columns packed with the ion exchange materials. However, the Examiner asserts that such is well known in applications using ion exchange materials for instance as is disclosed by Lee. It would have allegedly been obvious to one of ordinary skill in the art to use a cartridge as the form of a column in the ion exchange processes taught and/or obvious over Miyake because such is well known and practiced in the art as for instance is taught by Lee. As to any further

limitations of Claims 17 and 19, these are seen by the Examiner as intended uses which do not impart patentability to the claimed subject matter.

The rejection of Claims 17 and 19 under 35 U.S.C. § 103(a) is respectfully traversed.

Applicants argue that in Lee et al., a hydrophilic ion exchange group is bonded directly or very closely to a benzene ring in the hydrophobic site, and therefore, it is difficult to allow only a necessary amount of hydrophobic site in the polymer to remain. In Miyake et al., a monomer having an ion exchange group, which is previously synthesized (Syntheses 1 to 6), is polymerized and it is difficult to control the amount of “accessible” ion exchange group exposed to the polymer surface. In considering this comparison, it cannot be easily anticipated to produce a resin where only a necessary amount of ion exchange group is introduced into the hydrophilic site without changing the structure of the hydrophobic site, and use the resin for solid phase extraction, as in the present invention.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 103(a).

Claims 1-2 and 6-14 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by JP ‘610.

The Examiner asserts that JP ‘610 discloses copolymers useful as a precursor of ion exchange resins which are for example a copolymer of chloroethyl methacrylate, glycerol dimethacrylate and optionally methyl methacrylate (abstract); the glycerol dimethacrylate is present in amounts of 30 wt.% or more (abstract), which is a hydrophilic monomer, and the other

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monomers are hydrophobic monomers; the chloroethyl group is subsequently reacted with trimethylamine to form a quaternary ammonium group (paragraph bridging pages 5 and 6); the copolymer contains 0.01 to 1 meq/g of functional groups (abstract), and the exemplified particle size is 9-12 μm (paragraph bridging pages 4-5); in regards to any further limitations of Claims 11-14, these are believed by the Examiner to be intended uses and it is not seen that the particles disclosed by the reference could not be so used.

The rejection of Claims 1-2 and 6-14 under 35 U.S.C. §102(b) is respectfully traversed. Amended Claim 2 is not anticipated by JP '610. o/l

Applicants assert a major distinction that JP '610 describes a production method of an ion exchange resin precursor, where, however, an aromatic divinyl compound which is the hydrophobic monomer (A) of the present invention is not contained.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 102(b).

Claims 1-2, 6-8 and 10-14 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over JP '149.

The Examiner asserts that JP '149 discloses anion exchange resins prepared by the chemical modification of a copolymer of glycerin dimethacrylate and glycerin monomethacrylate which has a 70% degree of cross-linking (abstract); diethylaminoethyl groups are introduced by reaction of the copolymer with 13-diethylaminoethyl chloride under basic conditions (abstract); as ethylene glycol dimethacrylate (EGDMA) and diethylene glycol dimethacrylate (DEGDMA)

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are also taught to be used as the cross-linking monomer, it would have allegedly been obvious to one of ordinary skill in the art to use such in place of glycerin dimethacrylate, in whole or in part, as they are taught to be useful for equivalent purposes (page 2, upper right hand column); both EGDMA and DEGDMA qualify as hydrophobic monomers whereas glycerin mono- and dimethacrylates are hydrophilic monomers; the particle size is 1-20 microns and the ion exchange capacity is 0.05-0.5 meq/g (abstract); in regards to any further limitations of Claims 11-14, these are viewed by the Examiner as intended uses and it is not seen that the particles disclosed by the reference could not be so used.

The rejection of Claims 1-2, 6-8 and 10-14 Under 35 U.S.C. §103(a) is respectfully traversed. Amended Claim 2 is not anticipated by JP '149.

Applicants assert that in JP '149, similar to JP '160, an aromatic divinyl compound which is the hydrophobic monomer (A) of the present invention is not contained.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a).

Claims 16-19 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over (i) JP '610 as applied to claims 1-2, and 6-14 above, or (ii) JP '149 as applied to Claims 1-2, 6-8 and 10-14, and each further in view of Lee.

The Examiner asserts that JP '610 and JP '149 appear to be deficient in not disclosing columns and cartridges packed with the ion exchange materials. However, the Examiner states that such is well known in applications using ion exchange materials for instance as is disclosed

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by Lee. It would have allegedly been obvious to one of ordinary skill in the art to use either cartridges of columns to contain the ion exchange particles of either JP '610 or JP '149 in ion exchange processes because such is well known and practiced in the art as for instance is taught by Lee. As to any further limitations of Claims 16-19, these are seen as intended uses by the Examiner which do not impart patentability to the claimed subject matter.

The rejection of Claims 16-19 under 35 U.S.C. §103(a) is respectfully traversed.

For the same reasons as described above, Applicants argue in traversal for patentability over the references. Applicants submit that it cannot be easily anticipated to produce a resin where only a necessary amount of ion exchange group is introduced into the hydrophilic site without changing the structure of the hydrophobic site, and use the resin for solid phase extraction, as in the present invention.

Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejections under 35 U.S.C. § 103(a).

Allowable Subject Matter

Applicants appreciate the Examiner's acknowledgement that no prior art has been found which suggests or anticipates ion exchange resins prepared from a copolymer containing glycerol dimethacrylate as one of the monomeric units, which has been further reacted with epichlorohydrin and triethylamine or sodium sulfite to form ion-exchange groups.

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Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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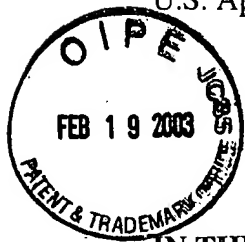
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Date: February 19, 2003



APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

Claims 1 and 8 are canceled.

The claims are amended as follows:

2. (Amended) A packing material for solid phase extraction, comprising a synthetic polymer obtained by copolymerizing a hydrophobic monomer (A) which comprises an aromatic divinyl compound and a hydrophilic monomer (B) which comprises a (meth)acrylic acid ester of a polyhydric alcohol having a hydroxyl group and introducing thereto an ion exchange group by a chemical modification comprising the step of introducing said ion exchange group by chemically bonding it to a hydroxyl group introduced from said (meth)acrylic acid ester of polyhydric alcohol having a hydroxyl group as the hydrophilic monomer (B), wherein said ion exchange group is covalently bonded to said polymer.

3. (Amended) The packing material for solid phase extraction as claimed in claim [1] 2, which contains an aromatic divinyl compound as the hydrophobic monomer (A) in an amount of 30% by mass or more based on a total amount of monomers.

4. (Amended) The packing material for solid phase extraction as claimed in claim [1 or] 2, which contains an N-vinylcarboxylic acid amide as the hydrophilic monomer (B) in an amount of 5 to 60% by mass based on the total amount of monomers.

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6. (Amended) The packing material for solid phase extraction as claimed in claim [1 or] 2, which contains a (meth)acrylic acid ester of a polyhydric alcohol having a hydroxyl group as the hydrophilic monomer (B) in an amount of 10% by mass or more based on a total amount of monomers.

9. (Amended) The packing material for solid phase extraction as claimed in claim [1 or] 2, wherein the ion exchange group covalently bonded is a sulfo group or a quaternary ammonium.

10. (Amended) The packing material for solid phase extraction as claimed in claim [1 or] 2, wherein an amount of an ion-exchange group covalently bonded is 5 μ -equivalent or more based on 1 dry gram of the packing material.

11. (Amended) The packing material for solid phase extraction as claimed in claim [1 or] 2, which packs a packing apparatus.

13. (Amended) The packing material for solid phase extraction as claimed in claim [1 or] 2, which is used for concentrating an objective component and/or removing impurities or contaminants.

14. (Amended) The packing material for solid phase extraction as claimed in claim [1 or] 2, which has an average particle size of 1 to 200 μ m.

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15. (Amended) A method comprising carrying out a solid phase extraction employing a column switching method and the packing material for solid phase extraction described in claim [1 or] 2.

16. (Amended) A column for solid phase extraction, comprising a column packed with the packing material for solid phase extraction described in claim [1 or] 2.

17. (Amended) A cartridge for solid phase extraction, comprising a cartridge packed with the packing material for solid phase extraction described in claim [1 or] 2.